CITY OF
SAN JOSE
CAPITAL OF SILICON VALLEY

SPECIFICATIONS
FOR

GOLD ST. STORM PUMP STATION ELECTRICAL UPGRADE PROJECT RE-BID

Robert Terada
Project Engineer
Terada Engineering, Inc.
Registered Electrical Engineer #E9236
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KATY ALLEN
Director of Public Works
Date: 7/8/08

PROJECT MANAGER: Michael McCullough

ADDRESS: CITY OF SAN JOSE
DEPARTMENT OF PUBLIC WORKS
ENGINEERING & CONSTRUCTION SERVICES DIVISION
1661 SENTER ROAD, BLDG A, 1ST FLOOR
SAN JOSE, CA 95112

TELEPHONE: (408) 975-7457
FAX: (408) 971-4692

2. The compressor is then started to purge and clean the air lines and replenish the compression bell with a 50-PSI air blast. The air blast is retained for 5 seconds (adjustable).

3. The 3-way valve is held in the purge position an additional 4 seconds after the compressor is stopped to allow the air dynamics to settle.

4. The 3-way air valve is now transferred to the normal level monitoring position and the level transducer signal are released to reflect the real time level value.

5. The system is now recharged with a 30-day supply of air in the compression bell and the controller operation is back to normal mode.

The tubes for the bubbler application within the MCC shall be of the polyurethane type rated for 125 psi working pressure and 375 psi burst pressure at 73 degrees Fahrenheit. Fittings shall be of Type 316 stainless steel. Tubes and fittings shall be as manufactured by Parflex or approved equal. The MCC supplier shall provide sufficient length of the tube for the field installation between the MCC and the compression bells in the wet well and the inlet structure as shown on the Plans.

86-62.03 PROGRAMMABLE LOGIC CONTROLLER/RTU

A. General

The programmable logic controller (PLC) shall be capable of independently controlling its site, to the extent that it normally has control, in the event that communications are lost with the central computer. The PLC shall be able to poll needed data from other remote PLCs with or without the central computer system in operation to keep the system running without going to a default mode. The specified features shall be readily available as an integral part of the PLC and shall be standard catalog items for the product. The use of any third party hardware or software add-on products to meet this specification is not acceptable.

B. Construction

The PLC shall be constructed using a card cage architecture incorporating a 96 pin 3U DIN VME standard backplane interconnection. The printed circuit cards shall be designed to slide into the card rack and interconnect with the VME backplane. A high density I/O card with a mix of I/O types as well as an I/O card for each individual I/O type shall be available. The system shall operate with a minimum of 2 cards and shall be easily expandable to 20 cards. The PLC shall be solidly mountable, but shall be capable of being removed easily in the field. Card cages with a capacity of 2 to 20 slots shall be readily available. All field wiring to the I/O cards shall be done at externally mounted terminal blocks with ribbon cable interconnects to the relative I/O card. The PLC shall have a conformal coating on the PC boards to protect it from harsh environments, if required.

C. Processor Card

The PLC shall be microcontroller-based, using a microcontroller that, at minimum, supports the following:

1. 32 Bit – 68360 Microprocessor
2. 25/33 MHz clock rate
3. Flat (non-segmented) memory addressing
4. RISC Communication Co-Processor
5. Serial DMA channels
6. Dual-ported RAM
7. Watchdog timer
8. 4 configurable timers with interrupt capability
9. 6 serial ports with separate baud-rate generators
10. Write-protect enable/disable

The Programmable Controller shall use a real-time, preemptive, multitasking operating system, contained in Read Only Memory (ROM). The ROM shall also contain all firmware that is not specific to a particular job or application, such as operator interface and communications firmware.

Application-specific programming and data shall be contained in battery-backed RAM. The RAM shall be low standby power, CMOS static RAM. The backup battery shall maintain RAM contents when the Programmable Controller is not connected to an external power source. The backup battery shall be a Lithium cell capable of continuously powering the RAM, in a standby state, for a minimum of 10 years with no loss of data. The Programmable Controller shall be available with a total of at least 1 megabytes of RAM.

The RAM shall be divided into two sections - write-protected, and non write-protected. The boundary between these two sections shall be user definable. Critical information, including the application program, control constants (setpoints), and configuration information shall be stored in write-protected RAM. Non write-protected RAM shall be used as a scratch area to hold temporary information and data values that are subject to constant change.

A dedicated TELCO style communications port shall be readily available for maintenance port operations using a laptop computer. Up to five additional communication ports shall be available for telemetry operations. A fault relay connector shall be readily available to provide closed contacts in the event of an internal failure or power loss.

The PLC shall have a digital communication module and capability to transmit and receive data and instructions via the local telephone company T1 line.

D. I/O Cards

The PLC shall support the following I/O cards:

1. High Density Input/Output Card:

6-Analog inputs
2-Analog outputs
16-Digital inputs
8-Digital outputs with 10A-relay contact

2. Sequence of Events Card:
   16-Digital inputs
   16-Digital outputs with 10A-relay contact

3. Analog Input Card
   16-Analog inputs

4. Analog Output Card
   8-Analog outputs

5. Digital Input Card
   32-Digital inputs

6. Digital Output Card
   32-Digital outputs w/ 10A-relay contact

E. Input/Output Characteristics

The PLC shall provide built-in digital filtering of analog inputs. The filter constants shall be adjustable from the keyboard and through the communications ports. Each analog input shall have an independent filter constant. The PLC shall provide a virtually infinitely variable wide range of adjustment from no filtering to extreme filtering. Each analog output shall have the ability to maintain output or zero output when entering standby mode. Each digital output shall be turned off when entering standby mode.

F. Field Wiring Terminal Blocks

The terminal blocks shall support the following listed characteristics:

1. Pull-apart two piece wiring blocks for fast and easy wiring/re-wiring

2. Separate wiring blocks for each I/O type and each wire point fully labeled

3. Versatile internal or external analog power source

4. Digital outputs with socket type 10A relays with LED "ON" indicators

5. All on/off standard track mount terminal blocks

6. Onboard passive circuit protection to protect PLC

7. A built-in isolated current loop power supply, powered from the 12V DC main power. The current loop power supply shall be capable of producing at least 24V DC and 161 mA.

8. 3 distinct classes of lightning protection

G. Power Supply

A 15V/5V DC power supply, with an allowed operating range of at least +/- 10% shall power the PLC. A 12V-battery backup of the 12V DC shall be available such that the 12V battery also maintains the 5V DC.

H. Operator Interfaces

The PLC shall be provided with a compact operator interface unit which is flush-mounted in the door.

The compact operator interface unit shall have at least the following attributes:

1. 60 Brite Lite LED annunciators with adjacent site-specific label descriptions

2. 8 Brite Lite LED mode annunciators and communication activity annunciators

3. 8 character Brite Lite alphanumeric display of at least 0.5 inches high

4. 4 keys to easily traverse a user-friendly menu tree which allows full control of operation

5. 4 user-programmed macro keys with adjacent site specific label descriptions

The operator interface and site specific nomenclature and labels shall be completely covered with a mylar overlay which is impervious to corrosive atmospheres and wash-down environments.

I. Operating Modes

The Programmable Controller shall have two basic modes of operation as described below:

1. RUN:

   a. Actively controlling, running application-specific control program
   b. Sensing input signals
   c. Generating outputs under program control
   d. Peer-to-peer message initiation is enabled
   e. Polling is enabled

2. STANDBY:

a. Not actively controlling, application-specific control program is stopped
b. Continues to sense input signals
c. Analog outputs held at current level or set to zero
d. Digital outputs go to off state
e. Initiation of peer-to-peer messages is disabled
f. Polling is disabled

J. Programming Language

The PLC shall be programmable using the IEC 1131-3 "Standard for Automation Programming Languages" which includes a full implementation of the following five languages:

In addition, the PLC shall have the ability to execute compiled C++ source code and also the ability to execute a higher-level BASIC-like programming language which is native to the controller. The native programming language shall at the least support the following attributes:

The programming language shall be line number oriented, with an allowed range of line numbers of at least 65,000.

K. Communications

The PLC shall have the ability to simultaneously support at least 4 serial communication ports which includes an Ethernet/IEEE 802.3 and a DeviceNet industrial network. Any of these serial ports shall be usable for both communications of telemetry data and control program/configuration upload/download and support baud rates of 230,400 bps or higher. The ports shall be configurable to support full handshake RS-232 (at least 3 ports must be configurable this way).

L. Protocols

The PLC shall implement the Ethernet/IEEE 802.3 protocol. When the PLC wishes to transmit, it will check for activity on the LAN. When the LAN becomes silent for a specified period, the PLC will begin transmission. During transmission, the PLC will continually check for a collision on the LAN. If a collision is detected, the PLC will cease transmission. The PLC will then wait a random period of time before attempting to transmit again.

The PLC shall support a DeviceNet Industrial Network. This device level Industrial network will enable the PLC to communicate to devices such as sensors, switches, relays, contactors, and control valves.

The PLC shall support serial communications using at least 3 different protocols. The de facto standard Modbus protocol shall be supported and shall include the correct/associated module(s) required. The PLC shall also support a protocol

capable of taking advantage of the advanced features available in the PLC (that Modbus would not be able to support). These protocols shall be able to coexist simultaneously within the PLC, while in operation.

The PLC shall support poll/response, polling master, quiescent, report-by-exception, and message routing communications - as described in the following sections. Any of these communications modes shall be usable alone or simultaneously in any combination.

M. Programming Software

A free copy of the native language programming software shall be provided with the PLC. The software shall be produced, provided and supported directly by the PLC manufacturer. No third party tools are acceptable. This software tool shall:

1. Execute on an industry standard IBM-compatible PC.
2. Execute under Microsoft Windows 2000 and Windows XP.
3. Windows 2000 32 Bit Multi-Threaded/MDI Application.
4. Project Management capabilities.
5. Communicates over existing telemetry communications paths.
6. Real Time Polling and onscreen variable updates.
7. Perform upload and download of all tables needed to configure the PLC.
8. Provide a batch upload and download feature to transfer multiple selected tables.
9. Perform any program assembly/disassembly functions and cross-references required.
10. Open files and selected directory from last session and present these upon restarting program.
11. Provide context-sensitive help.
12. Allow the user to change the operating mode (run/standby) of the PLC.
13. Allow the user to read and set the PLC real time clock.

The PLC shall be programmed for a duplex pump operation for the wet well pump down application with start and stop setpoints for each pump and high and low level alarms. The PLC shall monitor the wet well level signal from the

reactive air bubbler system and control the pumps. The programming shall match the City standard programming for storm water pumping application.

N. QuickLoad Software

A fast and easy to use software program shall be available free of charge to Upload and Download from a laptop computer to the PLC all calibration points, setpoints and native control programming.

O. Programming

Programming shall be provided by the MCC supplier and shall match the existing PLC programs currently residing therein and shall be compatible with the City of San Jose SCADA system. In addition, the PLC shall be programmed to monitor both the wet well and inlet structure levels to detect excessive differential between the levels which may be caused by say, clogged trash rack. When a high differential condition is detected, the PLC shall provide alarms locally and at the SCADA remotely.

P. The PLC shall be Tesco L2000 PLC+ or approved equal.

86-63 EXECUTION

86-63.01 MOTOR CONTROL CENTER INSTALLATION

A. Mount the MCC to the 2-inch high concrete/grout pad constructed on top of the existing floor. Install sufficient length of anchor bolts so that at least 4 inches of each bolt is embedded in the existing floor slab. Insure that the MCC is installed level and plumb. Install stainless steel shims as required before the final grouting.

B. Doors shall open and close freely and all manually operated device handles and controls shall operate properly. Repair any damage to the enclosure, components or finish to the satisfaction of the City. Clean all nameplates.

C. Install field interior wiring neatly by grouping by circuits and binding each group separately by plastic tie wraps. Support circuit groups sufficiently to avoid stressing circuit terminations.

D. Terminate all conduits entering or leaving the MCC into the top horizontal wireway directly above the vertical section in which the conductors are to be terminated.

86-63.02 TESTING

A. Test the MCC and its components in accordance with Subsection 86-10.

B. Test each control circuit for the function and logic required by the schematic diagram. Before performing the test, proposed test log sheets with a detailed, step-by-step check list shall be submitted for review by the City. After a

favorable review by the City the test shall be performed; and the log sheets shall be certified, signed and dated and shall be submitted to the City.

C. All field electronic components of the PLC/RTU system shall be thoroughly tested and burned in by the supplier or manufacturer before shipment from his facilities.

D. The PLC/RTU system supplier or manufacturer shall conduct a factory test of the complete system to be witnessed by the City and/or the Engineer, at the witness' option, prior to shipment to the job site. Submit a written notice of the factory test to the City at least 10 working days prior to the test. The equipment shall not be shipped to the job site unless written notice to ship is received from the Engineer.

E. Test the PLC/RTU for a functional check of each analog and digital signal and of each feature provided. After a successful test, the supplier shall repeat the test in the presence of the Contractor, the City, and the Engineer. Final field testing of system shall include 1-day acceptance test. The system shall be operated by the City personnel and used to perform the functions described herein. The system will not be accepted unless the system functions as specified, and without failure, to the satisfaction of the City and the Engineer.

F. Give the City at least 7 calendar day notice of the test days and allow the City the option to witness all tests.

86-63.03 LOOSE PARTS

A. Spare Parts

For the MCC, furnish the following spare items:

1. Six (6) spare fuses for each type and rating of fuse furnished in the MCC
2. One (1) LED bulbs for each color for the indicating lights
3. One (1) replacement coil for each starter and contactor size
4. One (1) control and time delay relay for each type installed
5. Touch-up paint
6. One (1) overload heater for each starter
7. One (1) starter and contactor replacement kit for each size.
8. Four (4) surge suppressors or MOV's for starter and relay coils.

86-63.04 MANUFACTURER'S SERVICE

A. The manufacturer of the equipment and accessories supplied in this Subsection shall

provide a qualified serviceperson to do the following:

1. Supervision:

   Instructing the Contractor regarding the installation of equipment. Checking the installation of all equipment before power is applied.

2. Checkout:

   Placing the equipment into operation and making necessary adjustments.

3. Instruction:

   The manufacturer shall include one (4) hour day to instruct the City's personnel in the use, operation and maintenance of all the equipment.

4. Verification:

   After the final acceptance by the City, for a period of one year, the manufacturer shall check the calibration and operation of all equipment at three month intervals and shall correct any defects in operation to the satisfaction of the City. The manufacturer shall notify the City at least one week before his visit.

B. For the PLC/RTU, furnish the necessary software and programming to provide the integration and interface of the PLC/RTU furnished under this Subsection. The supplier shall write and test all specific applications, and, in general, provide for the complete integration and interface as required. All programming shall be documented and shall require no maintenance by the City after installation.

C. Existing SCADA Integration

Configure the existing SCADA system with the following.

1. SCADA Configuration

   The SCADA system communications driver shall utilize the field RTU's native protocol Data Express Plus to communicate directly with the programmable controllers. This strategy allows the system to take full advantage of the PLC's built-in communications functions. All RTU and SCADA alarm setpoints, control setpoints, timer settings, and PID settings shall be selectable from the SCADA system screen.

2. Screens

   The PLC/RTU site under this contract shall receive a graphical depiction on the SCADA system encompassing each of the field parameters that are being monitored. Graphical depiction shall

include a rendering of the site, including all pertinent physical items such as pumps, tanks, meters, etc. Analog values shall be displayed in engineering units. Status points shall be displayed as ON/OFF and color-coded per the CITY'S requirements. Each site screen shall be accessible from the main overview screen via point-and-click functionality built into the overview screen. Other screen types shall be Communications Status, Alarm Summary, Runtime Manager, Trends.

3. Reports

Process data reports shall consist of Min., Max., and Average values on an hourly, daily, weekly, monthly basis for all pertinent analog values at each site. Totalized flow data where applicable per site, shall be archived in the SCADA system's historical database and displayed in printed report format. Mechanical / maintenance data such as pump run time and number of starts shall also be archived in the historical database and displayed in printed report format.

4. Trends

Analog points shall be trended on an independent trend screen per site. Historical and real-time trends shall be provided for each analog point. Each variable per screen shall be color coded independently from the other "pen" lines on the graph. The operator shall be able to zoom in and zoom out on any part of the trend for ease of reading. A cursor function shall be included which allows the operator to select a given point on the trend and receive information on the value of the trend at that point. The operator shall be given the ability to scroll forward and backward through the allotted time on any given trend by the day and by the hour.

5. Alarms

SCADA alarming software shall be configured for notification of field, communications, and system alarms. Alarm notification software shall be SCADAlarm by Wonderware, Inc. Provide high, low, instrument fail and mechanical malfunction alarms for all analog points in the system. Provide communications fail alarms. Whenever an analog point exceeds its associated alarm limit, or discreet point changes to an alarm state, an alarm message shall be printed on the alarm printer and stored to the historical database. The alarm message shall include, time, date, tag number, and alarm status. When the operator acknowledges alarms, the alarm message shall be stored to the database and printed again. When the alarm point returns to its normal range, the alarm message shall be printed and stored to the database.

6. Communications

Communications status shall be provided on the SCS display for the RTU that is associated with the points on the active display. Communications status for the RTU's shall be provided on an overview screen. Provide trends for the RTU-SCS communications link and communication alarms for the SCS-RTU communications link.. Communication back to the central SCADA system shall be via a dedicated T-1 digital phone line.

7. System Database

All field data collected by the SCADA server, as well as second-order-derived data, shall be stored to a central data repository that resides on the Ethernet network.

86-64 PAYMENT

86-64.01 PAYMENT for Subsection 86-60 will be made under:

Motor Control Center - Lump Sum